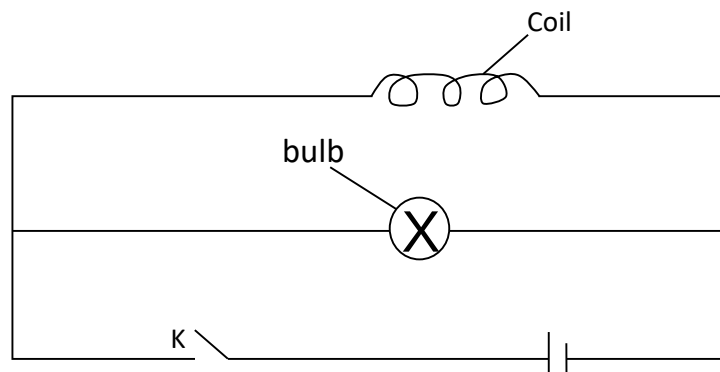


S6 AC TEST

Attempt Any Three Questions of Your Choice

TIME: 1:20 minutes

1. (a) (i) Distinguish between root mean square value and peak value of an alternating current. (2)
- (ii) Draw a sketch graph showing the phase difference between applied p.d. and current for a pure capacitor a.c circuit. (1)
- (b)(i) Explain why a capacitor apparently conducts alternating current. (2)
- (ii) The instantaneous value of a sinusoidal alternating voltage is given by, $V = 200\sin 60\pi t$ volts. Calculate the r.m.s. voltage and the frequency. (4)
- (c) (i) With the aid of a labelled diagram, describe how a repulsion – type moving iron meter operates. (4)
- (ii) Give two advantages of the moving iron meter over the moving coil meter. (2)
- (d) A 240V supply with a frequency of 50Hz causes a current of 3.0A to flow through an inductor of negligible ohmic resistance. Calculate:
- (i) Reactance of the inductor. (3)
- (ii) Inductance of the inductor. (2)
2. (a) (i) Define the term **impedance** and **full wave rectification** as applied to alternating current. (2 marks)
- (ii) A sinusoidal alternating current $I = 3 \sin (120\pi t)$ amperes flows through a resistor of resistance 2.5Ω . Find the power dissipated in the resistor and sketch a graph of voltage and current through the resistor on the same axes against time. (4 marks)
- (b) A coil of wire is connected in parallel with an electric bulb to a d.c source as shown in the figure below.



- i) At the instant switch K is closed, the bulb flashes briefly for a short time and then goes off. Explain the observation. (4 marks)
- ii) Explain what is observed when the d.c source is replaced by an a.c source. (03 marks)
- (c) (i) Define the term **reactance**. (1 mark)
- (ii) In an experiment to measure the reactance of a capacitor, the r.m.s current is measured to be 10mA. The peak to peak voltage is measured to be 16V. If the frequency is 10Hz; find the capacitance of the capacitor. (3 marks)
- (d) (i) With the aid of a diagram, describe the structure and mode of action of a hot wire ammeter in measuring alternating current. (5 marks)
- (ii) What is meant by the term a **rectifier** and give an example. (01 mark)
3. (a) Define resonant frequency in an ac circuit. (1 mark)
- (b) An alternating current $I = 2.0 \sin 120\pi t$ is passed through a *pure inductor* of inductance 0.4 H.
- (i) What is the meaning of the term *pure inductor*? (1 mark)
- (ii) Find the reactance of the inductor. (3 marks)
- (iii) Determine the root mean square voltage of the inductor. (3 marks)
- (c) Explain why the average power dissipated by a capacitor is Zero, when it is connected across an a.c source. (5 marks)
- (d) (i) A current $I = I_0 \sin 2\pi ft$ is passed through a resistor of resistance R ohms. Derive an expression for the average power expended in the device. (3 marks)
- (ii) The current in (i) is subjected to a series combination of a pure capacitor of capacitance C and a pure inductor of inductance L, and the circuit resonates at frequency f_0 . Derive the expression for f_0 . (2 marks)
- (iii) Sketch using the same axes, graphs of reactance against frequency for both inductor and capacitor in (ii) above. (2 marks)